1. A hybrid lay-up tool serving both as a form on which constituent materials are applied for bonding or curing into a part in a desired configuration, and for holding said materials in the originally applied position during subsequent machining of a peripheral edge of said part by a CNC machine tool while said lay-up tool is positioned on a bed of said machine tool, said CNC machine tool operating in accordance with a part program read by a CNC machine tool controller, said hybrid lay-up tool comprising:

a tool body made of composite material having a facing surface configured to a desired shape of one surface of a part to be made on said tool, said tool body having a reference plane whose orientation and height above said machine tool bed are specified in said part program;

a substantially continuous grove in said tool body opening in said facing surface;

a supporting structure supporting said tool body to maintain said facing surface in said desired shape;

said supporting structure having ground-engaging pads, each having a contact surface by which said supporting structure contacts and is supported by said machine tool bed, said contact surfaces defining an "A" datum plane;

attachments on said tool body for supporting said tool body on said supporting structure with said reference plane of said tool body parallel to said "A" datum plane;

whereby said materials for said part are applied on said tool body, bonded or cured, and edge trimmed thereon, all while on said tool body in said originally applied position, said edge trimming being performed by said CNC machine tool following said part program to move a cutter extending into said groove to engage the full thickness of said part, said groove corresponding in space to the position represented by said cutter path of travel in said part program by virtue of accurate relationship of said tool body reference plane and said "A" datum plane.

2. A hybrid lay-up tool as defined in claim 1, wherein:

said groove is dovetail in cross-section shape on a plane perpendicular to a longitudinal axis of said groove. said groove having a bottom width wider than the width at said facing surface.

3. A hybrid lay-up tool as defined in claim 1, further comprising:

a sacrificial material filling said groove and forming a top surface flush with said facing surface of said tool body.

4. A hybrid lay-up tool as defined in claim 3, wherein:

said sacrificial material includes a self-skinning foaming composition forming a dense hard skin flush with said facing surface of said tool body.

5. A hybrid lay-up tool as defined in claim 1, wherein:

said sacrificial material has bonded therein a strip of fiber to facilitate removal of said sacrificial material from said groove after said peripheral edge is cut around said part.

6. A hybrid lay-up tool as defined in claim 3, wherein:

said sacrificial material includes an epoxy material applied in said groove and co-cured with said materials for said part.

7. A hybrid lay-up tool as defined in claim 1, further comprising:

location devices on said tool for accurately positioning said base structure and said face sheet on a bed of a machine tool, whereby said machine tool may be programmed with configuration data regarding said groove and with location data regarding said supporting structure and tool body position for automatic cutting of said peripheral edge by said machine tool.

8. A hybrid lay-up tool as defined in claim 7, wherein:

said location devices include a set point and a sine key, each having accurately positioned pins for accurately positioning said supporting structure on said machine tool bed.

9. A hybrid lay-up tool as defined in claim 8, wherein:

said location devices include a tool ball socket in said face sheet for receiving a tool ball, said tool ball having a surface for engaging a probe operated by said machine tool to locate the actual position of reference surfaces on said tool.

10. A hybrid lay-up tool as defined in claim 1, wherein:

said base structure is made of Invar.

11. A hybrid lay-up tool as defined in claim 1, wherein:

said face sheet is made of graphite/bismaleimide material.

12. A method of manufacturing a hybrid lay-up tool for making a bonded and cured composite part, comprising:

fabricating a master mold having a mold surface shaped and sized like said part, said mold having an "A" datum plane with a known relationship to said mold surface;

installing reference features in said mold surface, said reference features effective to establish an orientation and location of said mold surface

laying-up a plurality of resin-impregnated fabric plies on said facing surface of said master mold, said resin matrix having the characteristic of bonding/curing at elevated temperature to create a rigid hybrid tool face sheet for said hybrid lay-up tool;

transferring said mold surface reference features to said hybrid tool face sheet;

applying a vacuum bag over said plies and sealing peripheral regions of said vacuum bag around said laid-up skin and components;

evacuating air from under said vacuum bag to cause air pressure outside said vacuum bag to press said vacuum bag against said plies;

bonding/curing said adhesive/resin matrix to transform said plies into said rigid hybrid tool face sheet;

removing said vacuum bag from said facing surface of said master mold, uncovering said rigid face sheet:

attaching said hybrid tool face sheet to a base structure;

machining a second "A" datum plane on said base structure; and

removing said hybrid tool from said machine tool bed.

13. A method of manufacturing as defined in claim 12, further comprising:

positioning said hybrid tool in a known position on a CNC machine tool bed using location devices to position said facing surface of said tool at a known position for surface milling ground pads on said base structure by a machine tool, and milling said ground pads parallel to said machine tool bed to establish said hybrid tool "A" datum plane;

loading a data set, having a digital definition of said lay-up tool, into a controller for controlling operation of said machine tool; and

guiding a cutter of said machine tool, with said controller operating a machine control program incorporating said data set, on a predetermined path around said face sheet of said hybrid tool, with said cuter cutting a substantially continuous peripheral groove around said face sheet.

14. A method of manufacturing as defined in claim 12, further comprising:

transferring said reference features in said mold surface to said face sheet to establish a reference plane for said face sheet.

15. A method of manufacturing as defined in claim 12, further comprising:

probing said reference features in said face sheet to establish the location and orientation of said face sheet and perform a normalizing routine to translate

machine instructions on a CNC tape used to control said machine tool to correspond to the particular location and orientation of said face sheet.

16. A method of manufacturing as defined in claim 12, further comprising:

probing said reference features on said face sheet with a probe mounted on said CNC machine tool to establish actual positions of at least three reference positions on said face sheet; and

normalizing said machine control program with said actual positions of said reference points to update data in said machine control program about said position of said tool on said machine bed from position data in said controller based on coordinates of said location devices.

17. A method of manufacturing a composite part on a hybrid tool, comprising:

coating a face sheet of a hybrid tool with a release agent, said face sheet made from a master tool having a mold surface the same shape and size as a surface of said part;

laying up plies of resin impregnated fabric material on said face sheet to a desired thickness;

debulking said plies in a vacuum bag with gas pressure, and curing said resin to form said part on said face sheet;

placing said hybrid tool on a machine tool bed at a position designated in a machine tool program using positioning devices;

probing reference features on said hybrid tool to accurately establish the position of said face sheet relative to a home position of the machine tool, said reference features having been transferred from corresponding reference features on said master tool;

normalizing said machine tool part program to correspond to the actual position of the hybrid tool on the machine tool bed as determined by said probing of said hybrid tool reference features;

operating the machine tool to rotate a cutting tool while following a cutting path along and within a groove in said face sheet so that said cutting tool projects into said groove and engages the full thickness of said laid-up part on said hybrid tool face sheet.

18. A method of manufacturing a composite part on a hybrid tool as defined in claim 17, wherein:

said face sheet of said hybrid tool is made of graphite/bismaleimide material.

19. A process of fabricating a hybrid tool having groove for peripheral edge trimming:

making an master mold having a mold surface and an "A" datum plane;

establishing reference locations on said mold surface;

laying up a composite face sheet on said mold surface;

curing the composite face sheet on said mold surface;

transferring said reference locations to the face sheet;

attaching a base structure to the face sheet;

machining an "A" datum surface on the base structure;

removing the hybrid tool from the master mold;

indexing the base structure in a machine tool bed and probing the reference features of the face sheet to accurately locate the position of the face sheet relative to a home position of the machine tool;

machining a groove opening in the top surface for receiving a cutter for edge trimming a part laid up on the tool surface

20. A process of fabricating a hybrid tool as defined in claim 19, wherein said face sheet is made of graphite- bismaleimide material.

21. A process of fabricating a hybrid tool as defined in claim 19, wherein said base structure is made of Invar material.

22. A process of fabricating a hybrid tool as defined in claim 19, wherein said base structure is made of planar Invar details cut from sheet by water jet or laser and slip-fit together, then welded in the desired configuration.

23. A process of fabricating a hybrid tool as defined in claim 19, wherein:

said machining of said "A" datum plane on said base structure is done using a CNC machine tool while supporting the hybrid tool on the bed of the machine tool with the plane of the "A" datum surface parallel to the top surface of the bed.

24. A process of fabricating a hybrid tool as defined in claim 19, wherein:

said machining of said "A" datum plane on said base structure is done while the face sheet is still attached to the master mold.

25. A process of fabricating a hybrid tool as defined in claim 19, wherein:

said machining of said "A" datum plane is done after removing the hybrid tool from said master mold, while supporting the base structure on supplemental legs on the machine tool bed. wherein the correct orientation of the hybrid tool on the machine tool bed is established by setting the length of the legs while the hybrid tool is till attached o the DFT.

26. A process of fabricating a hybrid tool as defined in claim 19, wherein said machining of said "A" datum plane on said base structure is done prior to attaching the base structure to the face sheet, the process including:

orientating the "A" datum plane of the base structure parallel to the reference plane of the face sheet by adjusting the position of the base structure over the face sheet using a measurement system, such as a laser tracker,

theodolite, coordinate measuring machine, while supporting the hybrid tool on bed of the machine tool with the plane of the "A" datum surface parallel to the top surface of the bed;

operating a CNC machine tool. under control of a machine controlling running a part program, to machine the "A" datum plane on the base structure parallel to the machine tool bed.

27. A process of fabricating a hybrid tool as defined in claim 19, further comprising:

attaching reference support structures on the master mold, the reference support structure having surfaces defining a reference plane parallel to the "A" datum plane of the DFT;

attaching tool reference support structure to said tool base structure, said tool reference support structure having surfaces defining a tool reference plane substantially parallel to an intended "A" datum plane of the tool;

supporting said tool base structure on a machine tool bed, on legs referenced to said tool reference support structure.

28. A method of making a composite part on a hybrid tool:

coating a face sheet of a hybrid tool with a release agent, the face sheet made from a master tool having a mold surface the same shape and size as a surface of the part;

laying up plies of resin impregnated fabric material on the face sheet to the desired thickness;

debulking the plies in a vacuum bag with gas pressure, and curing the resin to form the part on the face sheet;

placing the hybrid tool on a machine tool bed at a position designated in a machine tool program using spud and sine key;

probing reference features on the hybrid tool to accurately establish the position of the face sheet relative to a home position of the machine tool the

reference features having been transferred from corresponding reference features on the master tool;

normalizing the machine tool part program to correspond to the actual position of the hybrid tool on the machine tool bed;

operating the machine tool to rotate a cutting tool while following a cutting path along and within a groove previously cut into said face sheet so that said cutting tool projects into said groove and engages the full thickness of the laid-up part in the tool face sheet.

29. ~~A laid up part made in accordance with the process~~ defined in claim 25.

30. A process of making a hybrid lay-up tool having groove for peripheral edge trimming, comprising:

building a master tool having a mold surface like a surface of parts to be made on said hybrid tool, said master tool having an "A" datum plane;

building a base structure for the hybrid tool, the base structure having indexing features by which the base structure can be accurately indexed to a machine tool bed at a precisely known location;

laying up and curing a face sheet on the master tool surface;

attaching a base structure to the face sheet while the face sheet remains in its laid-up and cured position on the master tool;

establishing an "A" datum plane on the hybrid tool base structure parallel to the master tool "A" datum plane;

detaching the face sheet and attached base structure from the master tool;

indexing the base structure to a machine tool bed;

machining said groove in said face sheet using a cutter in said machine tool operating under control of a machine tool controller running a part program to direct said cutter along a path of travel like the path of travel used by the same or another machine tool to edge trim a part to be laid up on said face sheet.

31. A hybrid lay-up tool made according to the process defined in claim 30.

add #3